ON THE SILURIAN CORALS: *Cyathophyllum shearsbyi and Heliophyllum yassense.*

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(Plates V—VII.)

This revision has been made possible by the work in England of Dr. Stanley Smith, Dr. W. D. Lang, Mr. Ryder, and Mr. Tremberth on the types and species of various coral genera. The examination of the types of European genera is the essential basis on which the very necessary revision of Australian genera and species must rest.

The coral *Cyathophyllum shearsbyi* was described in manuscript by R. Etheridge Junr. 1904 and the name published in a footnote to a paper by him in the same year. Sussmilch published an excellent figure, but no description of the species, in 1914; and Chapman in 1920 gave a brief description and two figures of the coral.

T. A. Ryder in 1926 fully described and figured a generic series of three corals from England, and while there is a striking resemblance of *Cyathophyllum shearsbyi* to one of these, certain important differences of development make it advisable to found a separate genus for the Australian form.

HERCOPHYLLUM* gen. nov.

* τό ἔρκος—a net, referring to the thick net of dissepiments.

Genotype, *Cyathophyllum shearsbyi* Sussmilch, 1914, Fig. 143 facing p. 44, Limestone Creek, Yass, New South Wales, Silurian.

Diagnosis.—Simple, horn shaped or cylindrical, rugose corals which in the mature stage exhibit the characters of the corresponding stage of *Phaulactis* Ryder[1] but which differ from it in the brephic and neanic stages. In the brephic stage of *Hercophyllum* the septa are much dilated and laterally contiguous; in the neanic stage the dilation disappears and a lesser amount of dilation which is confined to the inner ring of dissepiments, the axial ends of the minor septa and the major septa at the same zone appears. In the ephebic stage this secondary thickening is reduced and finally disappears.

Remarks.—Although this genus is identical with *Phaulactis* Ryder in the ephebic stage yet the ontogeny, in my opinion, is sufficiently different from that of *Phaulactis* for it to be separated from the latter. The two genera, *Hercophyllum* and *Phaulactis*, are an excellent example of convergent evolution.

[1] For full details of this genus *see* T. A. Ryder (1926, p. 362 *et seq.*, plates XI, XII) and W. D. Lang and S. Smith (1927, pp. 457-8, 471-2).

The extended diagnosis of this genus as given by Lang and Smith reads:—"Simple subturbinate or cylindrical, straight or curved, Rugose corals, with long septa; no distinct axial structure; small distally arched tabulæ; and fine dissepiments, which may constitute the greater part of the coral tissue. In the earlier formed parts of the corallum the septa are typically much dilated and laterally contiguous; but in the later stages this secondary thickening is restricted to the axial ends of the septa, or is altogether absent."

HERCOPHYLLUM SHEARSBYI (Sussmilch).

(Plate V, Figs. 1a-1g ; Plate VI, Fig. 1a-1g.)
(Plate VII, Fig. 1h-1i and Fig. 2.)

Cyathophyllum shearsbyi C. A. Sussmilch (ex R. Etheridge, Junr. M./S.) 1914, Fig. 143 facing p. 44.

Cyathophyllum shearsbii Sussmilch ; F. Chapman, 1920, p. 183 ; pl. 18, Fig. 7 ; pl. 19, Fig. 9.

N.B.—Etheridge (1904 p. 288 footnote) introduced this name, but did not figure or describe the species. Harper (1909 p. 39 *et seq.*) and Shearsby 1912 p. 113 have both used the name without validating it.

Holotype, the specimen figured by Sussmilch 1914, Fig. 143, facing p. 43. Now in the collection of the Newcastle Technical College. The section cut from it is in the possession of Mr. Sussmilch.

Description.—External characters. The coral is turbinate, at first becoming cylindrical with age, when the diameter may be as much as 5 cms., and the length 12 cms.[2] The calyx has not been observed nor is the basal epitheca preserved on any specimen which the writer has examined.

Internal characters.—The major septa, 50 to 55 in number, are long and slightly flexuous, reaching to or almost to the centre, and in the mature stage are very thin and not dilated except perhaps very slightly at the theca. The minor septa are half to two thirds the length of the major, reaching to the theca where they may be slightly dilated.

The species is markedly bi-areal in character, the theca being formed by the junction of the nearly horizontal tabulae with the numerous small vertical strongly arched dissepiments. The extrathecal area is one half to two thirds of the size of the intrathecal. The tabulae are thin, numerous and incomplete, slightly arched distally. Secondary thickening is absent except perhaps for a slight development affecting part of both cycles of septa at the theca and the inner ring of dissepiments.

Description of the holotype.—The section reveals it to be moderately mature with slight septal dilation at the theca ; this is more marked on the cardinal septum side. The septa are very thin in the centre of the corallite.

Ontogeny (*see* plates v to vii).—The ontogeny as determined from serial sections of a considerable number of individuals differs materially from that described for the *Pycnactis—Mesactis—Phaulactis* series (*See* Ryder 1926, p. 393). The ontogeny of Ryder's series may be summarised as follows—slight attenuation of septa from the axis outwards followed by reduction of stereoplasmic thickening and attenuation of septa from the periphery inwards with the appearance of minor septa and dissepiments ; the ephebic *Phaulactis* showing but a little secondary thickening on the axial ends of the major septa or none at all.

[2] The writer has seen only one specimen of this size. Most are considerably smaller.

In *Hercophyllum* the earliest stage observed exhibits 23 major septa which are much dilated throughout their length and are embedded in a thick mass of stereoplasm which extends to the centre of the corallite. This stereoplasm is quickly reduced from the axis towards the periphery, and at the same time the septa are somewhat reduced in thickness. At the end of this, the brephic stage, the stereoplasm outside the septa has almost or entirely disappeared but the septa remain much thickened. In the neanic stage the progressive thinning of the septa, continues sometimes to completion, sometimes merging into the secondary thickening at the theca which appears towards the end of this stage. Minor septa and dissepiments are introduced. In the ephebic stage the coral presents the following appearance—an outer ring of numerous thin dissepiments, a zone of thickening at the theca, affecting the major and minor septa and the inner ring of dissepiments. The secondary thickening is progressively reduced and may disappear entirely, when the resemblance to a mature *Phaulactis* is complete.

Summarising the evolution is

1. reduction of secondary thickening from axis toward periphery ;
2. introduction of minor septa and dissepiments with renewed secondary thickening at the theca ;
3. reduction and final disappearance of secondary thickening.

It may be thought that the close resemblance of *Hercophyllum* to *Phaulactis* in the mature stage would justify its inclusion in the latter genus ; but it is increasingly recognised that it is more important to separate lines of evolution than to group together similar products of different lines. It was this consideration that inclined the writer to the view that the form under consideration should be regarded as generically distinct from *Phaulactis* Ryder.

Localities.—Limestone Creek, Yass, N.S.W. (Etheridge) ; Hatton's Corner, Yass, N.S.W. Upper Silurian. Native Dog Creek and Cowombat Creek, Limestone Creek District, Eastern Victoria (Chapman) Yeringian.

A specimen from Wellington, N.S.W. (Silurian) University of Queensland F3173 may be doubtfully referred to this species.

"HELIOPHYLLUM YASSENSE" Eth. fil.

The rugose coral "*Heliophyllum yassense*" was described from Yass by R. Etheridge, Junr. in 1892. The genus *Heliophyllum* was erected by Hall in Dana 1846 (p. 183) as a subgenus of *Cyathophyllum*. The type chosen by Edwards and Haime (1850, p. LXIX) is *H. halli* which equals *Strombodes helianthoides* ? Goldfuss (1826, p. 61, pl. XX, fig. 2) and Phillips (1841, p. 11, pl. V, fig. 13) ; Hall (1843, p. 209, fig. 3 on p. 209). This is not *Cyathophyllum helianthoides* of Goldfuss or of Phillips.

Heliophyllum halli is a Middle Devonian form with carinate septa, and for long after Edwards and Haime there was a tendency to lump together under *Heliophyllum* all cyathophylloid corals with carinae.

A paper by Dr. Stanley Smith and Mr. Tremberth published in 1929 has made it possible to state more clearly and certainly the relationships of "*Heliophyllum yassense.*"

Lang and Smith (1927, p. 461) described the new genus *Xylodes*, and Smith and Tremberth (1929) amplified this and described and figured the species *Xylodes articulatus* (Wahlenberg) and *Xylodes pseudodianthus* (Weissermel).

Under the species *Xylodes articulatus* and *Xylodes pseudodianthus* Smith and Tremberth group corals ranging from those with thin septa and without carinae to those with strongly developed carinae and generally thickened septa, the name *X. pseudodianthus* being confined to the latter, while *X. articulatus* includes forms with some carinae.

The description below shows that the coral *Heliophyllum yassense* Eth. fil. must be referred to the genus *Xylodes* and that its place in the series lies between those two species.

XYLODES Lang and Smith.

The genus *Xylodes* was erected by Land and Smith (1927, pp. 461-462) and a slightly amplified diagnosis was given by Smith and Tremberth (1929, pp. 362-363); this diagnosis is as under—

> "Phaceloid, dendroid (or even cerioid) Rugose Corals with marginal parricidal gemmation; with long typically unmodified septa, of which the major usually reach or nearly reach the axis, with tabulae differentiated into an outer and inner series and with numerous small dissepiments. Carinae may or may not be present, but there is no stereozone."

XYLODES YASSENSE (Eth. fil).

(Plate VII, Figs. 3-5.)

Heliophyllum yassense R. Etheridge, Junr. 1892, Rec. Geol. Surv. N.S.W., Vol. 11, pt. 4, pp. 170-172; pl. XI, fig. 8; pl. XII, figs. 1-3, Yass. Silurian.

Heliophyllum yassense Eth. fils.; C. A. Sussmilch, 1914, fig. 13, No. 5 facing p. 42, fig. 14a facing p. 44.

Holotype, Etheridge did not indicate a type specimen, but the specimen figured by Etheridge 1892, pl. 1, fig. 8, is usually regarded as the type. I have not been able to trace any of the specimens figured by Etheridge. In a letter to me the Secretary to the Trustees of the Australian Museum said the type specimen "is probably housed in the Mining Museum, Sydney, but a search made recently has failed to reveal it." If it is definitely established that this specimen is lost it will be necessary to select a neotype.

Etheridge's figure 8, pl. xi, is an external view of a well preserved typical colony of the species.

Description.—Corallites long, slender and cylindrical or squat and turbinate. The cylindical type often united by lateral processes. Major septa long meeting or almost meeting at the axis. Minor septa much shorter than the major. Carinae well developed, originating from a zig-zagging of the septa from which elbows arise. Secondary tissue almost absent. The dissepiments are small and strongly arched, forming a wide extrathecal area. The tabulae area differentiated into two series—a narrow outer series, small and distally concave and a wide inner series made up of distally arched plates irregularly placed and seldom complete.

Remarks.—The above description shows clearly that "*Heliophyllum yassense*" belongs to the genus *Xylodes*, but just where in the *articulatus-pseudodianthus* gradation it should be placed is doubtful. *Xylodes yassense* resembles *Xylodes articulatus* in

(1) the frequent occurrence of cylindrical forms
(2) the absence of secondary thickening.

It resembles *Xylodes pseudodianthus* in

(1) the external character of the turbinate forms.
(2) The character of the inner series of tabulae.

The development of carinae is not quite as pronounced as in *pseudodianthus*.

Etheridge described the species from material about which he said "I am not in a position at present, I regret to say whether the present specimens are from the Devonian or Upper Silurian of the Yass district, but in all probability they are from the latter."

His description of the external form is good and his illustration pl. xi, fig. 8 is excellent and one corallite shows well the marginal parricidal gemmation which is characteristic of *Xylodes*. His description of the transverse section is good, except that he considered that although the septa are very unequally developed, "no determinate subdivision into primary and secondary takes place." Pl. xii, fig. 1 is a good drawing of the transverse section and fig. 2 is an excellent enlargement of a number septa showing the type of carinae. Pl. xii, fig. 3 which he describes as "a partially vertical, partially oblique section" fails completely to reveal the character of the tabulae, and Etheridge did not recognise the two series characteristic of the genus.

Localities.—Hatton's Corner, Yass; Derrengullen Creek, Yass.

Age.—Upper Silurian.

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EXPLANATION OF PLATES.

PLATE V.

Hercophyllum shearsbyi (Sussmilch).

Figs. 1a–g. Serial sections of a specimen from Hatton's Corner, Yass, N.S.W. × 3. Now in the Queensland Museum. Reg. No. F2479.

PLATE VI.

Hercophyllum shearsbyi (Sussmilch).

Figs. 1a–g. Serial sections of a specimen from Hatton's Corner, Yass, N.S.W. × 1·5. Now in the University of Queensland. Reg. No. F3174, Sections Nos. 809 to 813. No. 1b is at about the same stage of development as Pl. V, No. 1d.

PLATE VII.

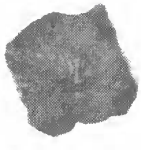
Figs. 1h–i. *Hercophyllum shearsbyi* (Sussmilch). Continuation of serial sections Pl. VI, × 1·5. Section Nos. 813, 814. Fig. 1h is a duplicate of Fig. 1f Plate VI.

Fig. 2. *Hercophyllum shearsbyi* (Sussmilch). Longitudinal section, × 1·5. Section No. 816.

Fig. 3. *Xylodes yassense* (Eth. fil.) specimen from Hatton's Corner, Yass. N.S.W. Transverse section of the turbinate type, × 3. Specimen in the University of Queensland. Reg. No. 1003. Section No. 807.

Fig. 4. *Xylodes yassense* (Eth. fil.) Longitudinal section, × 2. Section No. 804.

Fig. 5. *Xylodes yassense* (Eth. fil.) from Derrengullen Creek, Yass, N.S.W. Transverse section of the cylindrical type, × 3. Specimen in the Queensland University. Reg. No. F3164. Section No. 808.



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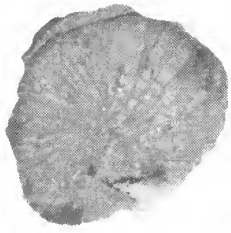

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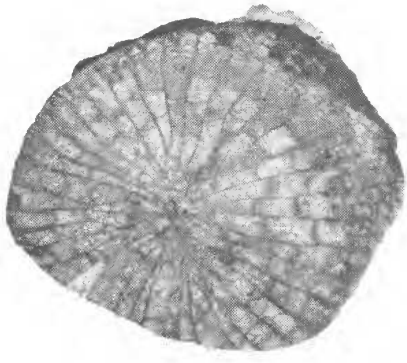

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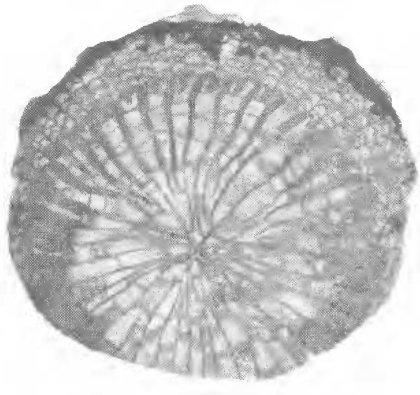

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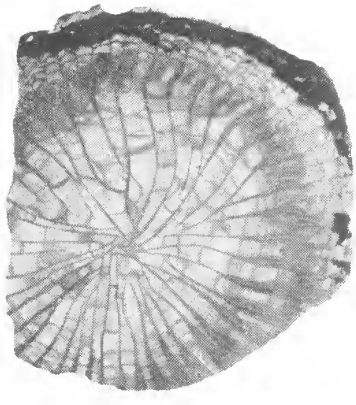

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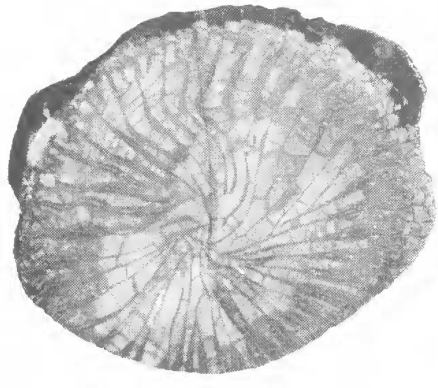

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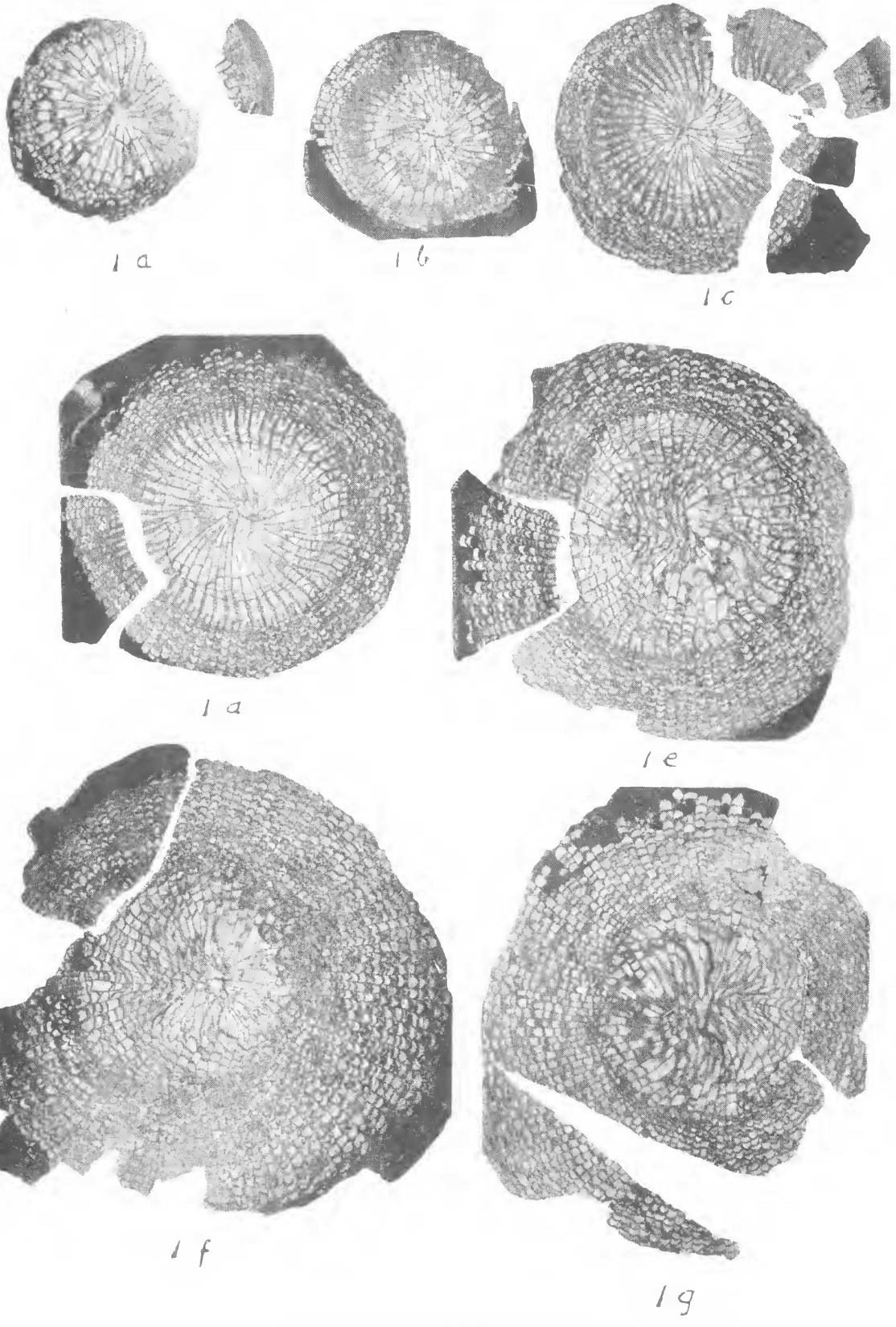
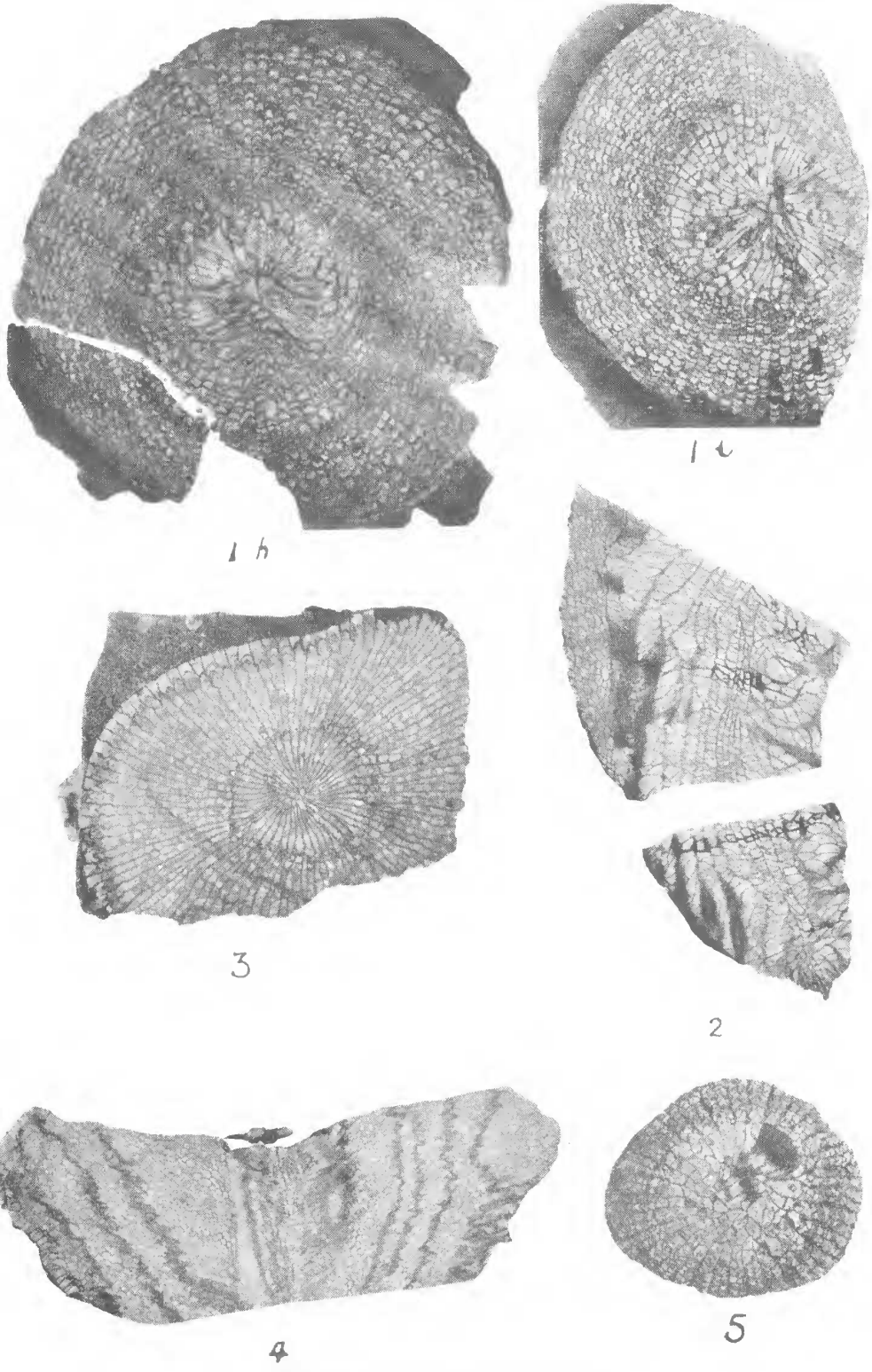


SILURIAN CORALS.—O. A. JONES.



Silurian Corals—O. A. Jones.